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ABSTRACT

The author considers the importance of evaluating preschoolers' perceptual motor development, the usefulness of various evaluation techniques, and the specific psychomotor abilities that require evaluation. He quotes researchers to underline the difficulty of choosing appropriate evaluative techniques and to stress the importance of taking preventative rather than remedial or rehabilitative approaches. Various taxonomies of psychomotor abilities are outlined. Review of available evaluation procedures is said to indicate that screening instruments are adequate although research on intervention strategies and stimulation programs is lacking. Fundamental, task-oriented movement patterns are charted. Physical educators are encouraged to develop the basic motor patterns and skilled movements that comprise physical fitness in programs for young children to insure that physical activities become an integral part of children's lifestyles. (GW)

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"Evaluating Motor and Perceptual-Motor Development"

(Subtitle "Evaluating the Psychomotor Functioning of Infants and Young Children")

by

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This paper/presentation will attempt to clarify the factual base which should underlie the evaluation of motor and perceptual-motor development in children. The presentation will also attempt to bridge the gap between researchers and practitioners by utilizing transparencies and slides to illustrate the key points which emerge.

Thus the following specific questions will be dealt with:

1. Why evaluate the psychomotor functioning of children anyway? (justification, Essential-Fundamental-Functional Model)

2. How should evaluation be approached? (task vs. process/human performance orientation, formative-summative evaluation vs. experimental research)

3. What specific evaluation procedures should be employed? (systematic observation, rating scales, quantity vs. quality of performance).

4. What are the specific psychomotor abilities and/or developmental tasks which should be evaluated? (psychomotor domain classes, specific expected behavior, motor behavior age (MBA))

Let's turn for a moment to imagine the PRODUCT we want to have developed by three, five, or seven years of age. What psychomotor competencies or skills should be observed in this age child?

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At any rate I'm going to "jump in the deep end for the first time not knowing whether I can really swim or not"--- but thinking I can!

I would emphasize strongly that the EVALUATION SYSTEM should serve as the basis for program development, justification of program, and accounting for improvement or lack of.

A major concern in evaluation of human psychomotor abilities is the lack of utilization of the factual information relative to measurement of the underlying processes or abilities and instead the "almost preoccupation" of simply providing activities for kids. This has gotten us into trouble with many administrators relative to "the anyone can supervise play period" syndrome!

I have taken, in this presentation, a somewhat radical departure from the usual in discussing motor development in children. Physical educators, except for the few (Espenschade and Eckert (1960), Cratty (1970), Corbin (1973), Rarick (1975), have generally occupied themselves with a rehabilitative or remedial orientation to motor development by starting with the child after six years of age. There is a wealth of information on elementary physical education programs. However, there has been little attention given to preschool psychomotor development by physical educators. Yet I would have to say to you all - "Here's where it's at!"

So for a few moments I will attempt to give an overview of and justify my case for physical educators becoming concerned with and involved in the psychomotor development of the preschool child.

The following general definitions should precede the formal presentation: (stipulated by the author)

1. Motor Development - Refers to the identifiable process (sequence and rate) of emerging observable behaviors in the infant and child.

2. Psychomotor Domain - The domain of observable behaviors--indicates cognitive or perceptual involvement by the prefix "psycho".

3. Perceptual - An organizing, interpreting, understanding component (3 generally accepted parts --
INPUT → INTERPRETATION → OUTPUT
(and accompanying feedback processes)

4. Evaluation - The process of identifying strengths and weaknesses (obtaining useful information) for making educational decisions.

5. Developmental Tasks - "A developmental task is a task which arises at or about a certain period in the life of an individual, successful achievement of which leads to his happiness and to success with later tasks, while failure leads to unhappiness in the individual, disapproval by the society, and difficulty with later tasks (Havighurst, 1972)."

6. Abilities (Psychomotor) - Those underlying attributes which determine observed performance levels; the potential for functioning.

Major Consideration in Evaluation

Factor analysis studies indicate the full emergence of an adult factor structure in the motor domain of human abilities by five years of age. Similarly, it is agreed that after five or six years of age, on the average, no new basic skills appear in a child's movement repertoire. Rather the quality of performance in motor tasks continues to improve.

> . . . It is imperative, therefore, that the infant and preschool years be carefully examined in order to understand the determinants of motor development and their effects on subsequent motor behavior during the school ages. [Corbin p.34]
>
> (Substantiated by the work of Guilford (1958), Meyers and Dingman (1960), and Espenschade (1969))

Newell (1975) went on to suggest three main approaches to testing a child's motor behavior ---

(1) the traditional task-oriented or descriptive approach
(2) the more recent attitude of process-oriented evaluation which tends to be diagnostic and
(3) reflex testing of which he states "Inhibition of reflex action is undoubtedly one of the most important functions of the body, and procedures for examining this in the infant and young child are relatively well established [p.81]."

Since the majority of reflex testing is conducted by the medical and allied health professions, Newell (1975) focused his comments on task- and process-oriented approaches and projected a human performance approach for the future.

He went on to suggest a fourth, evaluative type, approach labeled the "Human Performance Approach" based upon the assessment of the entire process from input through output stages. In this approach the need to attempt to evaluate single underlying abilities, as diagnostic labels, is emphasized. Why does the child have some particular motor functioning problem, rather than simply describing what a child can't do, became the issue at hand.

However, this call by Newell (1975) for a more precise evaluation methodology does not neglect the need for practitioner oriented screening devises. He states, "Practitioners essentially need a simple quick screening test which will give them an overall objective estimate of the developing child's physical and neurological system [p.86]." Therefore, he suggests the "what and when" of a child's motor performance be left to a screening device and the "how and why" designated to a diagnostic test. The former could be administered for screening purposes by a practitioner, the latter by a specialist to proceed with remedial or rehabilitation procedures.

Cratty (1970) in writing suggests the following in measuring young children:

> "Numerous measurement problems have plagued scholars attempting to evaluate the motor abilities of children. Young children are extremely variable in the manner in which they decide to perform given skills, as they often have not worked out efficient work methods that for them would prove helpful. Thus a researcher may construct what he believes to be a consistent testing instrument and then find that the performance of children who are exposed to this testing instrument is extremely unreliable. The socres he may collect one day from a given group of children may be dissimilar to the scores that he collects on a second day on the same tests by the same children [p.68-69]."

There are major considerations which should be recognized relative to the evaluation of the psychomotor functioning of infants and young children. Newell (1975), after reviewing (with Lewko) the general area of motor assessment of young handicapped children, wrote, 'It would not be an exaggeration to say that our immediate reaction was that the area concerned with the assessment of children's motor behavior seemed to be in a state of disarray [p.78]." There seems to be a large number of professionals across

different disciplines utilizing a large number of instruments and techniques. In fact, Newell (and Lewko) found the 207 respondents of their survey utilizing 256 apparently different tests.

PREVENTIVE CONCERNS IN INFANCY

A major point is simply that a PREVENTIVE approach early would be much better than the remedial or rehabilitative approach traditionally taken. We generally take a child at eight, ten, sixteen years of age and start there. Okay this may be better than nothing but we should be evaluating the developmental process of the infant and young child from birth.

Child development specialists, psychologists, special educators (Gessel (1946), Bayley (1968), Shirley (1931), McGraw (1946), Kephart (1960), Jersild (1960), Hurlock (1964), Guilford (1958)) have for years emphasized the importance preschool psychomotor development plays in the total development of the infant and young child. It is as though practically everything which is learned originates by the human organism becoming ACTIVELY involved in its new environment. Barritt (1972) summarizing Piaget in this regard wrote:

> The human being Piaget describes is consistent from birth through adulthood in his desire to understand, make sense out of the things he sees, hears, feels . . . The very young child before two years of age is guided by his physical equipment in these efforts. He is the sensory-motor searcher who sucks, grasps, looks, and listens. He knows through his action. He must act to know [p. 1]."

"Fowler (1975) in discussing the importance of monitoring the development of the infant wrote

> . . . Since the basic foundation is established only once it had better be well built. . . The set of basic rules . . . are mastered only in proportion as they are well learned in early development. . . Following Piaget (1952), it would appear that the child finds his mapping knowledge of the nature of physical world and his own identity and capabilities for action and problem solving through his infant sensory motor explorations and manipulations with objects in local space [p. 11]."

Fowler goes on in discussing the weaknesses of some of the early developmental work (Gessel, et al.) to write ". . . they reduced themselves to the roles of grand collectors, chroniclers, and describers of culturally influenced norms of basic fine and gross motor development. They made monumental contributions, but also misleading ones, ones which discouraged understanding of mental processes and retarded understanding of the importance of regulating experience to prevent deviance and promote acquisition of motor competencies [p. 4]."

THEORETICAL FRAMEWORK

There is need for a theoretical framework for systematic study of the psychomotor domain. Bloom (1956) and Krathwohl (1964) decided there was not enough interest to warrant them pursuing such, so Guilford (1958), Meyers and Dingman (1960), and Harrow (1972) with the help of factor analysis studies of Rarick (1975), Vandenburg (1964), Fleishman (1970), Musgrove (1970), Ayres (1965), Thomas (1973), and program development work of Cratty (1970), Roach and Kephart (1966), Wickstrom (1970), Godfrey and Kephart (1969), Barsch (1968) et al. have attempted to develop the classes and subclasses of abilities in several different areas of functioning levels in the young child. Table 1 presents the major taxonomic classes of the psychomotor domain and interjects a matrix in the "EFF" Model for utilizing motor skills in the developing organism as depicted in Figure 1 and further defined in Table 2.

Fleishman (1970) wrote,

> "Perhaps not too extreme statement is that most of the categorization of human skills, which is empirically based, comes from correlational and factor-analytic studies. Such categories can be thought of as representing empirically derived patterns of response consistencies to task requirements varied in systematic ways. In a sense, this approach describes tasks in terms of the common abilities required to perform them [p. 548]."

Fleishman and his colleagues have conducted a whole series of interlocking experimental-factor analytic studies, attempting to isolate and identify the common variance in a wide range of psychomotor performances.

> "The purpose has been to define the fewest independent ability categories which might be most useful and meaningful in describing performance in the widest variety of tasks [p. 548]."

Table 1. PSYCHOMOTOR DOMAIN FACTORS

Guilford (1958)

PSYCHOMOTOR ABILITY FACTORS

I. Strength
II. Impulsion
III. Speed
IV. Static precision
V. Dynamic precision
VI. Coordination
VII. Flexibility

*matrix approach which distinguishes part of the body involved in the ability factors - separates "gross" from specified body parts

Harrow (1972) TAXONOMY

1.00 Reflex Movements
2.00 Basic-Fundamental Movements
3.00 Perceptual Abilities
4.00 Physical Abilities
5.00 Skilled Movements
6.00 Non-Discursive Communication

Bayley (1968) Mental Factors

1. Visual following (2 to 3 months)
2. Social responsiveness (3 to 7 months)
3. perceptual interest (1 to 2 and 15 to 17 months)
4. manual dexterities
5. vocalizations (5 to 14 months)
6. object relations (10 to 17 months)

Meyers and Dingman (1960)

(4 to 6 years of age, series of factors in 7 domains hypothesized)

DOMAIN 1: Psychomotor, Whole-body Factors

1.1 postural balance
1.2 dynamic balance
1.3 impulsion
1.4 coordination
1.5 flexibility
1.6 strength

DOMAIN 2: Psychomotor, Hand-Eye

2.1 Static precision
2.2 dynamic precision
2.3 reaction time
2.4 dexterity
2.5 speed

Fleishman (1970) Psychomotor Abilities

1. control precision
2. multilimb coordination
3. response orientation
4. reaction time
5. speed of arm movement
6. rate control
7. manual dexterity
8. finger dexterity
9. arm-hand steadiness
10. wrist, finger speed
11. aiming

Physical Proficiency

1. extent flexibility
2. dynamic flexibility
3. static strength
4. explosive strength
5. dynamic strength
6. trunk strength
7. gross body coordination
8. gross body equilibrium
9. stamina

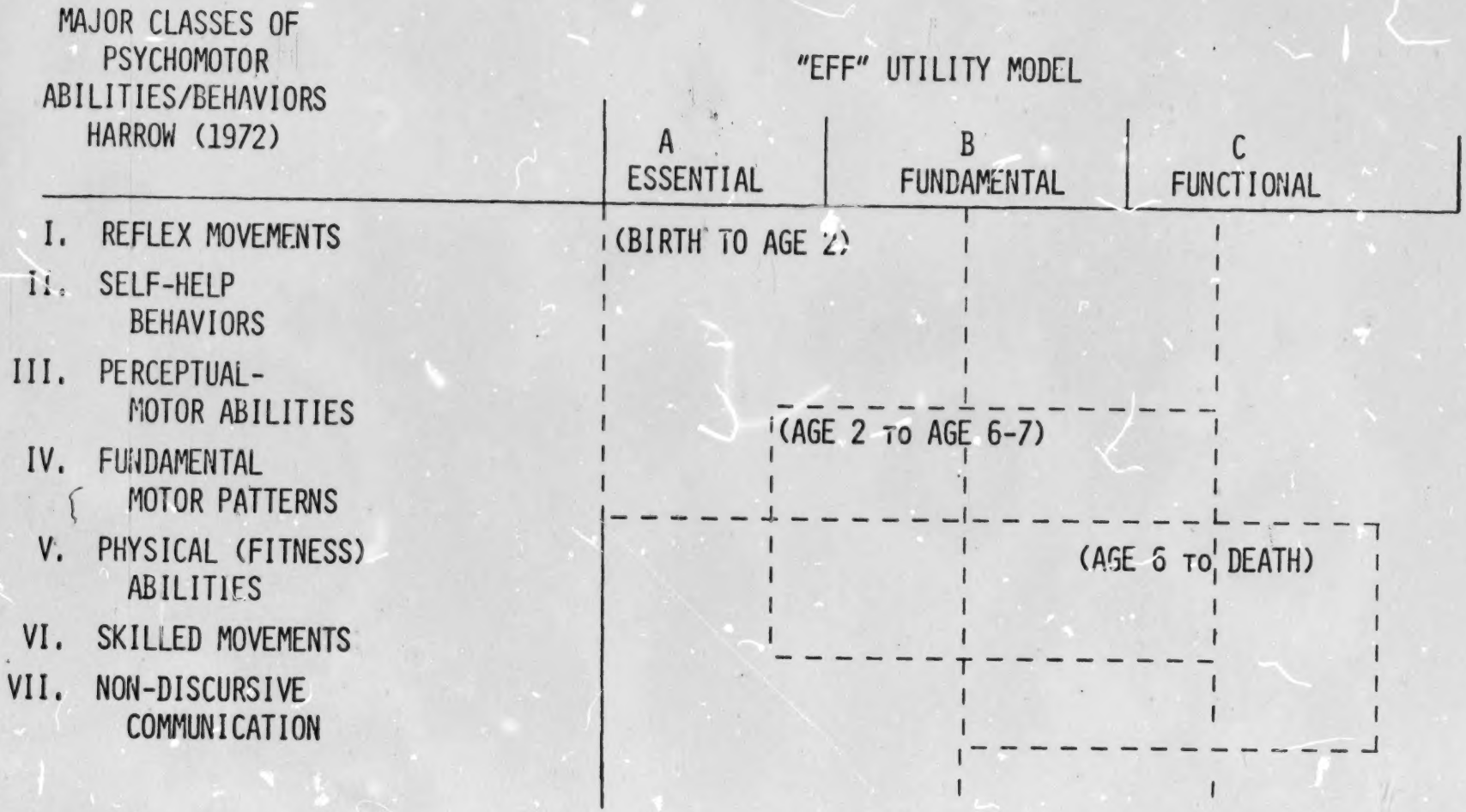

FIGURE 1. MATRIX PSYCHOMOTOR ABILITIES BY "EFF" UTILITY MODEL

THE FOLLOWING DEFINITIONS ARE PRESENTED IN AN ATTEMPT TO CLARIFY WHAT SEEMS TO BE A VERY COMPLEX DOMAIN OF BEHAVIORS FOR THE PRACTITIONER:

TABLE 2. DEFINITIONS "EFF" MODEL

A. ESSENTIAL - MOTOR SKILLS WHICH ARE ABSOLUTELY NECESSARY FOR ADEQUATE (AT LEAST MINIMAL) FUNCTIONING IN ORDER TO BE ACCEPTED INTO SOCIETY.

B. FUNDAMENTAL - MOTOR SKILLS WHICH ARE NECESSARY FOR ADEQUATE FUNCTIONING ("MINIMAL ACCEPTABLE FUNCTIONING LEVEL") IN FUNDAMENTAL MOTOR PATTERNS, (FOR SOCIALIZATION WITH PEERS), PERCEPTUAL-MOTOR ABILITIES (FOR ACADEMIC READINESS), AND PHYSICAL FITNESS ATTRIBUTES (FOR PREVENTION OF DETERIORATING DISEASE AND MAINTENANCE OF GOOD HEALTH THROUGHOUT LIFE).

C. FUNCTIONAL - MOTOR SKILLS WHICH ARE DEVELOPED AND UTILIZED FOR THE EXPRESS PURPOSE OF ACHIEVEMENT IN SOCIETY, E.G. RECOGNITION OF ATHLETIC, MUSICAL, ARTS AND CRAFTS, OR OTHER TECHNICAL ACCOMPLISHMENTS, EVEN TO THE EXTENT OF PROFESSIONAL CAREERS WHERE PSYCHOMOTOR SKILL IS THE BASIS OF EMPLOYMENT.

Recent work of Bayley (1968) would appear to substantiate the somewhat theoretical descriptive criteria (task oriented) for factors of the Denver Developmental Scales (Frankenburg and Dobbs (1970) and the Peabody Developmental Scales (1974). Bayley's longitudinal study of 54 individuals from birth to 36 years of age, has found that an infant's abilities can be factored into six separate attributes by the age of five months, including:

1. Visual following
2. Social responsiveness
3. Perceptual interest
4. Manual dexterities
5. Vocalization
6. Object relations

Meyers and Dingman (1960) in summarizing motor factors wrote,

> ". . . whole vs. part-body should be evident by two years; a nearly full display like the adult structure of Guilford is expected by 5 years of age [p. 526]."

Harrow (1972) has produced one of the few indepth theoretical models for classifying behaviors in the psychomotor domain. Her model can be quite useful in designing what should be evaluated (See Table 1 for major classes of Harrow's Taxonomy).

SPECIFIC EVALUATION PROCEDURES

In studying development from birth through infancy, to two years of age, the reflex behaviors apparent at birth or soon after and which rapidly fade out during the first two years have been rather precisely defined by the medical profession. The importance of where the problem really appears to exist in objectively classifying and measuring is with the birth to three or four year old where there are initially communication problems and later attention span problems. At the very young levels, it would appear the evaluation instruments available for reflex behavior assessment and the descriptive evaluation of expected motor development (essential locomotor and self-help skills) of infancy would appear adequate for screening purposes. The intervention and subsequent stimulation of development, where problems are identified, is another matter.

From the standpoint of assessment immediately after birth the APGAR Scale (1953), the Milani-Comparetti reflex test (1967), the Estimation of Gestational Age Chart (1974) and descriptive materials by Cratty (1970) and others appear to be adequate for assessing normal ranges of expected functioning motorically. The Denver Developmental Scales developed by Frankenburg and Dobbs (1970), the Bayley Scales (1969), and the Peabody Motor Developmental Scales (1974) appear to be adequate in evaluating expected functioning of infants and young children on a variety of motor tasks.

The infant motor development of essential self-help skills is well described and due to lack of communication systems at this time, the processes and underlying mechanisms must be dealt with theoretically. Project MATCH emphasizes the importance of the sensory motor period to total development of the human organism. Fowler (1975) supported this development relative to the basis of cognition relative to basic rule systems relative to concept formation. It would appear systematic observation procedures and careful projection of underlying abilities which determine functioning potential should be utilized morewidely in the infant stage of development. A number of projects (some 55 at least) aimed at developing strategies for developmentally disabled infants are in progress throughout the United States (Wade 1976). These projects are developing a whole new theoretical position on intervention strategies to stimulate infant development!

Current descriptive instruments being utilized for screening purposes include the Denver Developmental Scales (1976) (validated on 1,036 children), the Bayley Scales Infant Development, revised (1969), the Peabody Motor Developmental Scales (1972) (validated by Folio (1975) and the Cooper and Heinze (1974) USM-ESS Motor Development Checklist, revised.

The importance of these descriptive screening instruments to the evaluation of psychomotor behavior in infants and young children is that they each have sought to revalidate projections from the earlier work of Gessel (1933-1954), Bayley (1935-1936), and others. These newer scales have also considered the need for recognition of an "acceptable range of functioning", and also the employment of qualitative criteria. The Denver Scales utilize a bar graph format and allow age reference points for 25%, 50%, 75% and 90% of the norm group relative to accomplishment of developmental tasks in four areas: language, social, gross motor, fine motor. The uniqueness lies in easy administration and certainly the recognition of an acceptable functioning range is a plus factor.

The Peabody Motor Developmental Scales (1974) employ the areas of gross and fine motor scales for assessment purposes. The strength of the Peabody Scales lies in the attempt at qualitative assessment. A five part rating scale from total dependence (for help) to total independence in performing a task is utilized to assess the young child. It also recognizes the need for a "comment space". Folio (1975) has since the earlier development conducted additional validation work on the scales.

The Cooper and Heinze (1974) revision of the USM-ESS Motor Development Checklist utilized a format of yes, no, doubtful for response and then a comments column. This seems quite workable from field testing and observations of motor development class students.

A key point relative to these descriptive checklists is the fact that they all are based upon well documented developmental tasks; they are task-oriented screening instruments. If problems are suspected then a specialist should be utilized for diagnosis and possible remediation as soon as possible. There unfortunately are few specialists available in infant stimulation and to use a pun "this movement is in its infancy!"

Bayley (1968) in a published longitudinal study of 54 individuals from birth to 36 years of age postulated that infants' abilities can be factored into six separate attributes by age of five months including visual following, social responsiveness, perceptual interest, manual dexterities, vocalizations, and object relations. This gives credence to the area, generally being assessed by available scales and lends support to Newell's (1975) process and human performance orientation toward evaluation.

Perceptual-Motor Evaluation

Seefeldt (1972) has defined "perceptual motor" as ". . . a sequence of events which requires a motor response, but are primarily designed to improve the functional capacity of the visual, auditory, proprioceptive, or tactual modes of perception [p. 3]."

A note of concern should be stated here about perceptual and perceptual-motor development. "Perceptual" as a term refers to a processing interpreting understanding phenomenon primarily cognitive (brain function) in nature, motor refers to the "output" or observable movements resulting from the perception. Perception is interpreted by this writer as a bridging sort of ability between the cognitive and psychomotor domains. Perceptual-motor ability

involves the receiving of stimuli, the interpretation and organization of this stimuli into meaningful information, and finally the resulting output (maybe and maybe not correct), and finally feedback on the performance whether internal or external (See Figure 2).

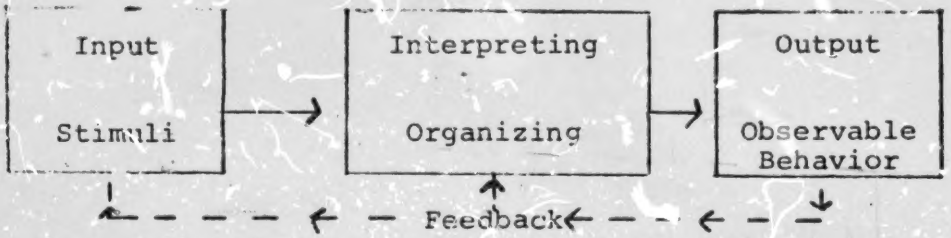

FIGURE 2. PERCEPTUAL PROCESSES

The perceptual-motor area of functioning is important from soon after birth--whenever awareness of sensory information begins. Assuming sensory activity is present and there is not dysfunction in the perceptual processes, perceptual-motor evaluation plays a vital role in assuring that critical pre-school concepts are adequately developed. The primary purpose of perceptual-motor evaluation is to assess readiness for learning expected academic tasks. Fowler (1975) emphasized the development of a rules structure for the development of cognition and referenced the early beginnings of this to Piaget's Sensory motor period.

Much of the contemporary program work (Getman (1952), Barsch (1968), and Kephart (1960)) is questionable relative to a sound research base to substantiate the many claims which are made.

Factor analysis studies, though few, give the most respectable base for evaluation at the present time. A number of researchers have contributed to the effort, e.g. Ayres (1965), Musgrove (1970), Thomas (1971, 1973, 1974), Vandenburg (1964), and the almost voluminous work of Fleishman (1959, 1964, 1970) (See Table 3).

Ayres (1964) factor analyzed a thirty-six item battery of perceptual and fine motor functioning variables and compared the factor structure of learning and non-learning disabled subjects.

Musgrove (1970) using 80 first and second grade children factor analyzed a battery of twenty-eight test items developed by Cratty (1966) and Roach and Kephart (1966). She identified nine factors.

TABLE 3. IDENTIFIED PERCEPTUAL-MOTOR FACTORS

perceptual-motor . . . a sequence of events which require a motor response but are primarily designed to improve the functional capacity of the visual, auditory, proprioceptive, or tactual modes of perception. Seefeldt (1972)

AYRES (1965)	MUSGROVE (1970)	OSERETSKY MOTOR DEVELOPMENT SCALE	FLEISHMAN (1968)
1. developmental apraxia	1. visual tracking	(Sloan (1955)) (Cassell (1949)) (Vandenburg (1964))	("individual differences variables")
2. tactual, kinesthetic, and visual perceptual in form and position in space.	2. visual discrimination and copying of rhythmic pattern	1. general static coordination	1. control precision
3. tactual defensiveness	3. visual discrimination and copying of forms	2. dynamic manual coordination	2. multilimb coordination
4. deficit of integration of the two sides of the body	4. verbal body image	3. general dynamic coordination	3. response orientation
5. deficit of visual figure-ground discrimination	5. dynamic balance	4. motor speed	4. reaction time
	6. spatial body awareness	5. simultaneous voluntary movements	5. speed of arm movement
	7. postural maintenance	6. asynkinesia (i.e. lack of precision of movement or surplus movement)	6. rate control
	8. visual discrimination and copying of motor patterns		7. manual dexterity
	9. gross agility		8. finger dexterity
			9. arm-hand steadiness
			10. wrist, finger speed
			11. aiming

Chissom and Thomas (1971) and Thomas (1973) analyzed the factor structure of the widely used Frostig Developmental Test of Visual Perception. Utilizing data from eleven previous studies, analysis of nine of these clearly indicated that a single factor described (50 to 60% of the total variation) the five hypothesized Frostig subtests.

Another test battery of motor development, which appears to try to evaluate underlying processes, is the Oseretsky Motor Development Scale. The Oseretsky Test was constructed in Binet-like fashion and organized by age levels from 4 to 16 years. Russell (1949) and Sloan (1955) developed adaptations of the Oseretsky Test and their work appears to offer valuable insight into motor functioning among exceptional children. Vandenburg (1964) synthesized research pertaining to the Oseretsky Test and concluded that the nature of factors measured by the test needs further clarification and that ". . . It seems desirable to correlate this test with some of the measures of factors in motor performance proposed by Seashore; Fleishman, and others [p. 38]." Table 3 presents the factor structures identified by the research here summarized. These factors identified would appear to provide the underlying process and human performance oriented factual base called for by Newell (1975). There, of course, needs to be a great deal more research relative to the various cause and effect interactions which may affect successful human functioning.

FUNDAMENTAL (MOVEMENTS) MOTOR PATTERNS

Once the basic essential tasks, locomotor and non-locomotor, are accomplished attention turns toward development of the already discussed basic readiness concepts through perceptual-motor development. Along with this, once upright locomotion (basic gross motor) and some fine motor (feeding, dressing) skills are accomplished, skill (efficiency) of movement proceeds toward the learned motor skills usually referred to as fundamental motor patterns or movements. These movements are fundamental to various movement tasks commonly employed in our society as well as prerequisite to many games and developmental tasks considered important in the socialization process (Havighurst, 1972) and for the maintenance of health and physical fitness.

Hottinger in Corbin (1973) wrote, "Early childhood from two to six years, is a significant learning period. Most of the fundamental movement patterns develop to a fairly high level provided the environment furnished ample opportunity [p. 17]."

Keogh in Corbin (1973) indicated that, "By age four and five, children have mastered basic skills of postural adjustment, locomotion, and manipulation to the extent that they can effectively move in and respond to their environment [p. 57]." He goes on to discuss the increasing difficulty, as the child grows older, to describe changes and differences in motor skills [p. 57]." Therefore, in referring to evaluation, Keogh in Corbin (1973) suggests it is important to examine performance on motor tasks that are common in the experience of most children.

This leads us to the analysis of observable behavior or what is commonly referred to as "task or activity analysis." Keogh went on to write. . ."Changes and differences in performance on motor tasks can be described qualitatively and quantitatively in relation to age, sex, and numerous person and social conditions [p. 57]."

This need for task analysis, for evaluation purposes, leads to the question what should be analyzed and to what degree? Wickstrom (1970) and Godfrey and Kephart (1969) have provided rather detailed analyses of form and the latter rather carefully describes "deviations noted" in the Movement Pattern Checklist (See Table 4).

Another major point of reference in evaluation would be the utilization of the mass of factual data available on performance curves across ages. Both for boys and girls it has been well established that performance, up to a point (puberty) improve on a linear or relatively straight, upward trend. Norms for expected average performance ranges are available and should be utilized for evaluation purposes.

This leads to a word of caution about consideration of interacting variables. The growth process is constantly causing the child to become older, heavier, taller, and bringing about certain proportional changes structurally and physiologically. Seefeldt (1971) has also emphasized the relationship of motor development to developing social and emotional functioning. He also stressed the need for ". . . ample opportunity for practice

TABLE 4. FUNDAMENTAL MOTOR PATTERNS AREAS
(TASK ORIENTED)

WICKSTROM (1970) FUNDAMENTAL MOTOR PATTERNS	GODFREY AND KEPHART (1969) MOVEMENT PATTERNS	CORBIN (1973)
1. Running	A. Locomotion patterns	1. Climbing
2. Jumping	1. Walking	2. Jumping
3. Throwing	2. Running	3. Hopping
4. Catching	3. Jumping	4. Galloping
5. Kicking	4. Hopping	5. Skipping
6. Striking	5. Skipping	6. Throwing
	6. Crawling	7. Catching
	7. Climbing	8. Ball Bouncing
	8. Rolling	9. Swimming
	9. Sliding	
	B. Balance patterns	
	1. Standing	
	2. Sitting	
	3. Bending	
	4. Straightening	
	5. Stretching	
	6. Twisting	
	7. Rotating	
	8. Swinging	
	C. Handling Objects - Propulsive patterns	
	1. Throwing	
	2. Hitting	
	3. Blocking	
	4. Pushing	
	5. Pulling	
	6. Lifting	
	D. Handling Objects - Absorptive patterns	
	1. Catching	
	2. Trapping	
	3. Carrying	

under guided instruction [p. 21]" which calls attention to the need for a planned environment for the child to interact with. Since most of infancy and early childhood is individual and/or parallel play, when these critical skills are developing, the "structuring of the environment" becomes a major teacher competency.

PHYSICAL FITNESS OR PROFICIENCY

Underlying the development of fundamental motor patterns and later skilled movements are certain identified abilities. Perceptual-motor abilities are involved and so are abilities commonly referred to as physical fitness or physical proficiency by Fleishman (1964).

Fleishman's (1964 etc., etc.) massive research production has provided us with the suggested factor structures of underlying abilities in both the perceptual motor and physical proficiency areas. However, work does not include analyses on age ranges of children. Rarick (1975, 1975a, 1975b, 1970, 1976), Pangle (1958), Cobb (1972), Bissonnette (1973), and Romain (1976) have or presently involved in factor analytic studies seeking to describe the underlying abilities of physical fitness. Table 5 describes the factors previously identified.

There seems to be a major need to start early with young, in the physical fitness area, relative to ingraining concepts relative to the maintenance of adequate fitness levels throughout life. The areas of the ratio of fat to lean body mass, flexibility, and cardiovascular endurance are of particular importance and the development of a positive concept toward activity, it appears, must begin early in life if it is to become ingrained in life styles. Therefore, it appears imperative that we, as physical educators, evaluate and translate to children their physical fitness status as early in the educational program as possible.

Rarick (1972, 1975, 1976) has extensively investigated the basic components in motor performance of children normal and mentally retarded from age 6 though about 12 years of age. In comparing the factor structure of children 6-13 years of age with previous factor analytic work of older ages he (1972) wrote,

> "The factor structures that emerged differed considerably from the hypothesized factor

FLEISHMAN (1964) PHYSICAL PROFICIENCY (AGES 12 and UP)	RARICK (1975) PHYSICAL FITNESS (AGES 6 - 10)	PANGLE (1954) (AGES 6-12)	BASSIONNETTE (1973) (AGES 7-8 and AGES 11-12)
1. extent flexibility 2. dynamic flexibility 3. static strength 4. explosive strength 5. dynamic strength 6. trunk strength 7. gross body coordination 8. gross body equilibrium 9. stamina (cardiovascular endurance)	COMMON FACTORS 1. strength-power body size 2. gross limb eye coordination 3. fine visual motor coordination 4. fat or dead weight 5. balance (static & dynamic combined) 6. leg power and coordination (2 specific factors of flexibility)	1. strength and speed 2. body build & growth 3. hand-eye coordination 4. pulse rate function 5. muscle power	1. body fatness 2. body dimension-static strength 3. hip flexibility 4. recovery pulse 5. muscular endurance

COBB (1972) (1st,2nd,3rd grades)	SHORE (1972) (1st,2nd,3rd grades)
Most Valid Measures 1. Clarke's strength composite 2. McCloy's endurance ratio 3. leg extension & flexion 4. Well's sit and reach 5. dodging run 6. Bass length-wise stick balance 7. Vertical jump	1. muscular strength 2. balance 3. muscular endurance 4. flexibility (3 factors) 5. an unidentifiable factor

TABLE 5. PHYSICAL (FITNESS/PROFICIENCY) ABILITY FACTORS (PROCESS-HUMAN PERFORMANCE ORIENTATION)

> structure in the sense that the factors that were extracted were in many cases composites of basic components that had been found in earlier factor analytic studies of young adults [p. 2]."

A well-defined factor structure of motor abilities was identified by Rarick (1972) in both normal and mentally retarded boys and girls. The factor structure for normal boys and girls was similar, and the structure for the M.R.'s was less well-defined but essentially like that of the normals.

In his studies of trainable mentally retarded children (N=453) Rarick (1975) found seven comparable common factors: (1) fat or dead weight, (2) fine visual motor coordination, (3) balance, (4) upper limb coordination, (5) arm strength, (6) spinal flexibility, and (7) leg power-coordination. It should be mentioned here that in all of the data comparing normals and M.R.'s, the M.R.'s functioning is significantly below the normals. Whether this is due to the condition of mental retardation or lack of activity is not presently known however, this data should be utilized in evaluating mentally retarded children. Norms exists in the Special Fitness Test Manual for the mentally retarded (1968) and a recent publication on the moderately retarded is available.

Some of previously stated research has suggested expected functioning levels across ages for elementary age children. Information in this regard is also available in Haley's (1971) and Gaar's (1972) recent work. Also available is the A.A.U. Physical Fitness materials developed which has norms from five through 17 years of age.

SUMMARY

The controversy or dilemma which exists in evaluation of development in the psychomotor domain relates to a phenomenon which has been occurring over the past decade in the research-evaluation area. There are many field related types of variables that may not be amenable to the strict experimental procedures traditionally utilized in the behavioral sciences. We, surely, would all agree that there are certain things we might learn from continual and systematic observation of human functioning that we might not gain from a one-shot testing session with a supposedly validated instrument. A whole new sub-discipline, relative to research methodology, has developed with the onset of quasi-research and evaluation strategies (Campbell and Stanley (1963), Popham, Stufflebeam (1971), Stake (1967) and Provos.

Seefeldt (1972) probably best summarized the appropriateness of traditional approaches as compared to evaluation strategies by writing:

> "It is likely that the evaluation procedures to which perceptual-motor programs have been projected were premature and generally inappropriate. . . the common method of analysis (pretest-treatment-and posttest with accompanying control and placebo groups) employs the method of summative evaluation. It is based on the hypothesis that the treatment will cause significant differences to occur in the experimental groups. However, in perceptual-motor programs we are less than knowledgeable about the variables which influence performance. This situation suggests that formative, rather than summative, evaluation is the logical first step in acquiring information concerning effective procedures in remedial motor education. (Stake (1967), Stufflebeam (1971)).
>
> Formative evaluation is a continuous testing procedure which operates concurrently in the experimental program. Small samples are exposed to various procedures and tested in their ability to meet program objectives with the view toward determining their effectiveness. Whenever indicated the objectives and techniques are changed immediately. The process of testing and revision continues until the objective is met by the target sample.

> The process of formative evaluation is highly recommended for emerging educational programs for several reasons. It insures that educational objectives are commensurate with student abilities, and it moves the educational researcher from his ivory tower into the classroom. . . [pp.10-11].

I apologize for using such a long quotation, however, Seefeldt deserves this to be exactly repeated. One last sentence by Seefeldt sums up rather well our past problems in the research field, "Volumes of irrelevant research reports attest to the fact that theory without practical utility is as wasteful of human resources as practice which is not guided by theory [p.11]."

As can be readily observed, the whole area of evaluation relative to motor and perceptual-motor development is a very complex procedure. One basic problem appears to be a lack of existence of a comprehensive model for at least trial and error purposes on a broad scale. Within this broad problem there are various smaller ones e.g.

*the uncertainty of task vs. process oriented evaluation procedures

*involvement of practitioners with very little training in the psychomotor area

*unqualified professionals projecting programs with little validated factual basis

*a real need exists in defining more precisely the "acceptable minimal functioning level" for successfully functioning in our society

*(MBA) motor behavior age should be a key reference point when employing remedial procedures for children in the middle childhood and teenage years

The model, here suggested as a basis for evaluation of motor and perceptual-motor development, is a consolidation of the task-oriented and process/human performance-oriented suggestions previously referred to (See Figure 3).

It should be pointed out that the model presents only the major categories or classes of human abilities and functioning and that there are many subcategories in each of these areas, many of which have been presented earlier.

Newell wrote,

> "As Wedell (1973) has pointed out it is very difficult to generate a test item or motor task which reflects a single process, but it would seem possible to devise more tasks that are more process pure and specific than presently exist. As I recently indicated, the key seems to be to develop or select an item in which the majority of the performance variance is accounted for by the process under consideration. Previous tests have not striven for this one to one correspondence between process and test item. This makes a diagnostic label a better description of the task itself than the process or functional component that the task was designed to measure [p.84]."
> Milwaukee Roundtable Newell (1975)

As in the cognitive and affective domain taxonomies (Bloom) (1956), Krathwohl (1964) and mastery learning concepts projected by Block (1971) psychomotor development proceeds from simple to complex functioning in an identifiable hierarchical manner.

In the model projected it should be pointed out that there are underlying processes or human performance abilities, psychomotor abilities, according to Fleishman (1972), which could be thought of as determiners of potential for functioning. These underlying abilities should be evaluated by specialists with the objective being diagnostic and prescriptive relative to identifying weak ability areas and prescribing improvement or alternative learning strategies. On the other hand, the task-oriented observation and evaluation of expected observable behaviors in the developmental task area should be the role of the practitioner (classroom teacher, etc.) in everyday contact with the child with the express purpose of screening out those children who are not functioning within expected ranges. Emphasis at this point should be given to the point that you don't necessarily do one before the other. The specific local setting should determine which comes first, the PROCESS or the TASK relative to evaluation!

It seems somehow appropriate to terminate this paper with some comments by Rosentswieg as written in Corbin (1973):

> "Evaluation is central to learning. All theories of learning emphasize the importance of knowing what has occurred in order to make necessary behavioral adjustments to attain a desired goal. . . Ultimate reasons directing behavior may never be known but the observable aspect of a performance can and should be evaluated in terms of the achievement of extrinsic, known goals [p. 165]."

> "What is believed necessary is a combination of many instruments and procedures that take into account the needs of each individual while motivating everyone to do the very best he is capable of doing [p. 172]."

I've attempted to cover what I believe to be the major points relative to evaluation of motor and perceptual-motor development. I wish I could conclude by saying "you're doing a great job, keep up the good work" but I can't. We in physical education have done a very poor job in developing expertise relative to accepting the responsibility, producing research, practitioners, and professionals in the area of the development of valid and reliable procedures for evaluation in the development of basic psychomotor behaviors. The frontier line is drawn and physical education needs to seriously consider the responsibilities which are evident.

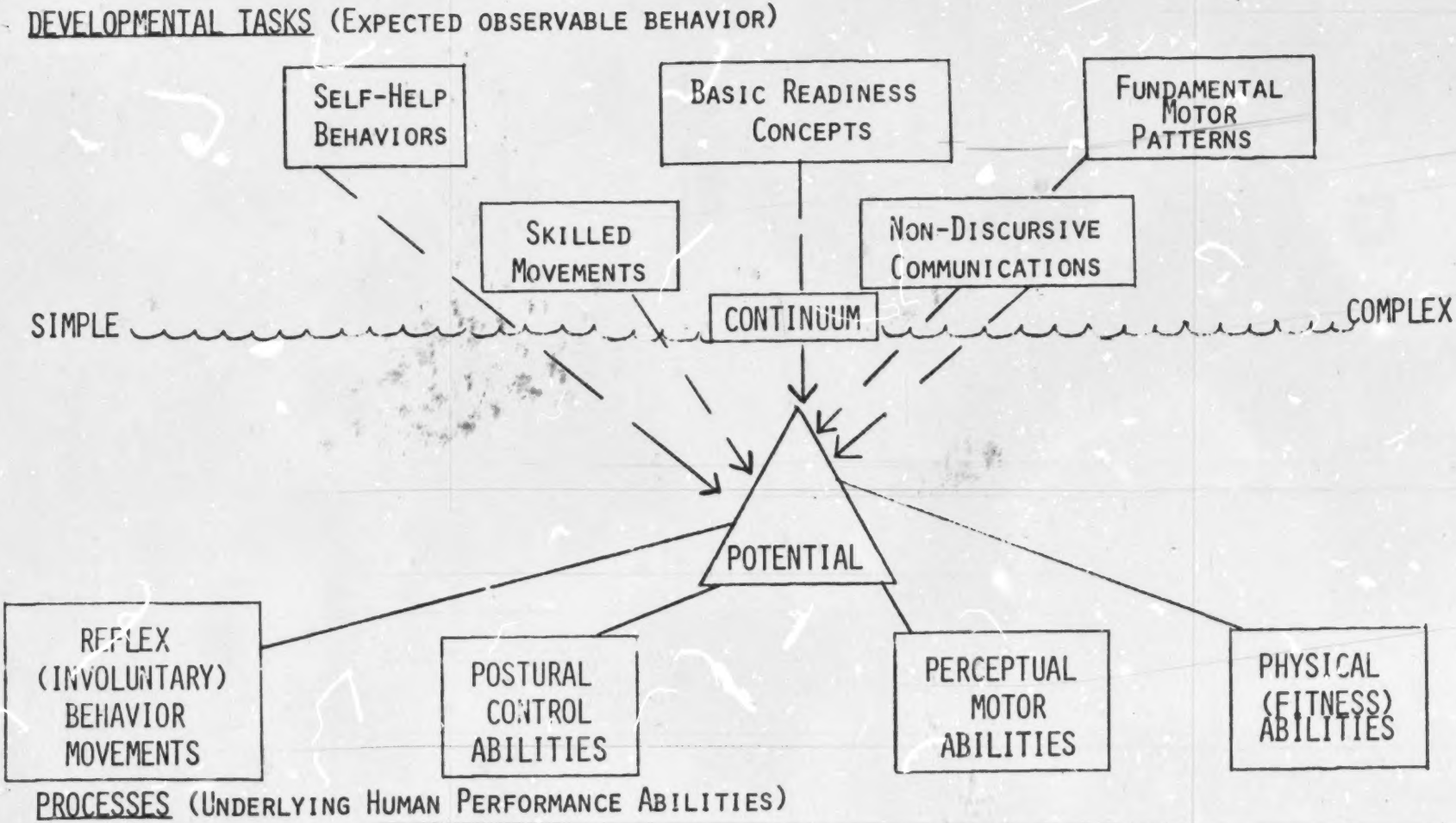

FIGURE 3. MODEL FOR CLASSIFYING EVALUATION PROCEDURES IN THE PSYCHOMOTOR DOMAIN
COOPER (1976)

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